UNITED STATES OF AMERICA

TO ALL WHOM IT MAY CONCERN:

BE IT KNOWN THAT I, BARRY B. BAUMAN of 1396 Highland Road West, Kitchener, Ontario Canada, N2N 3K6, Canadian Citizen, have invented certain new and useful improvements in

CONTAINER DISPENSER, of which the following is a specification:-

BACKGROUND OF THE INVENTION

FIELD OF INVENTION

This invention relates to a container dispenser and, more particularly, to a machine for automatically dispensing containers of beverages and the like.

DESCRIPTION OF THE PRIOR ART

Automatic dispensing machines are known and are used to dispense beverage containers as well as containers containing food. The beverage dispensers are by far the most common and machines are known for dispensing cans, glass bottles and plastic bottles. In the soda industry, glass bottles were replaced by cans many years ago and, today, plastic containers are replacing cans. The modern consumer is more health conscious and bottled water is extremely popular along with a host of non-carbonated flavoured water based beverages as well as fruit juices and sport drinks. Most containers for beverages have an elongated shape and plastic containers and soda cans have greater longitudinal strength than lateral strength. Vending machines for beverages typically store and move the containers through the machine horizontally. It is important to have a large number of selections on the machine as there are a large number of different products available. It is also important to have large storage facilities for each selection. Previous machines have a relatively low number of selections. Those previous machines that have a large number of selections have a low storage capacity for each selection or they are susceptible to becoming jammed, or they are too complex or expensive to manufacture.

Some previous vending machines jam frequently or the containers are damaged while they are moved within the machine or the machines fail too frequently.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a dispensing machine that stores the containers vertically within the machine and continues the vertical orientation up to the time that each container is released to the outlet. It is a further object of the present invention to provide a dispensing machine that can readily provide twelve or more selections. It is still a further object of the present invention to provide a dispensing machine of conventional size that stores twenty four or more containers for each selection when the machine has been filled with containers.

A container dispensing machine is used for automatically dispensing containers where each container has a base and a top with said top being smaller than said base. The dispensing machine comprises a plurality of vertical guides means arranged in at least one set, the vertical guides means being sized so that a plurality of containers can fit within each of the guide means longitudinally with said base being located beneath said top. There are two abutments rotatably mounted in a plane substantially normal to a longitudinal centre axis of the at least one set. An actuation is connected to rotate the two abutments by part of one turn in the plane for each activation. Each of the two abutments has a cutaway portion. The two abutments are an upper abutment and a lower abutment. The abutments are oriented so that the cutaway portion of the upper abutment is vertically offset from the cutaway portion of the lower abutment by at least the distance that the two abutments rotate in one activation. The abutments rotate about the longitudinal centre axis of the at least one set. The upper abutment is sized to rotate without damaging the containers on the lower abutment, the abutments being separated by

less than a height of one container. The vertical guides have an opening therein corresponding to a level of the upper abutment to allow the upper abutment to pass through the vertical guides. The dispensing machine has an outlet for any containers that pass the lower abutment.

Preferably, the vertical guides are a plurality of tubes, said tubes being arranged in a set with two abutments for each set.

A method of dispensing containers from a dispensing machine stores and dispenses containers longitudinally from vertical guides within a housing of the machine. The containers have a base and a top with the top being smaller than the base. The method comprises arranging a plurality of vertical guides in at least one set, locating two abutments and a plane normal to a longitudinal centre axis of the at least one set, mounting the abutment vertically apart from one another by a distance that is less than a height of one container, locating a cutaway portion in each abutment, offsetting the cutaway portions from one another, locating the abutment on an actuator to rotate the abutments, filling the guides with containers and activating the actuator to dispense containers from the at least one set at the rate of one container for each activation.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings:

Figure 1 is perspective view of a dispensing machine having a housing containing fifteen sets of tubes;

Figure 2 is a perspective view of a cluster of three sets of tubes;

Figure 3 is a side view of the cluster of Figure 2;

Figure 4 is an end view of the cluster of Figure 2;

Figure 5 is a perspective view of an actuator;

Figure 5A is a side view of an actuator;

Figure 6 is a partial perspective view of one set of tubes with a front tube removed to expose the actuator;

Figure 7 is a partial perspective view of one set of tubes viewed from beneath the actuator;

Figure 8 is a top view of an upper abutment;

Figure 9 is an edge view of the upper abutment;

Figure 10 is a top view of a lower abutment;

Figure 11 is an edge view of the lower abutment;

Figure 12 is a schematic bottom view of a set having four cylindrical tubes;

Figure 13 is a schematic top view of the set of Figure 12;

Figure 14 is a bottom view of a set of four tubes with containers located in said tubes;

Figure 15 is a schematic perspective view of containers on the actuator;

Figure 16 is a schematic perspective view of the containers shown in Figure 15 with an upper front container removed; and

Figure 17 is a perspective schematic view of a set of four tubes having a square cross section.

DESCRIPTION OF A PREFERRED EMBODIMENT

In Figure 1, there is shown a dispensing machine 2 having a housing 4 containing fifteen sets 6 of tubes 8. The housing 4 has a front 10 and a rear 12. A door (not shown) of the housing 4 has been omitted. The door would be hinged to a front 10 of the housing 4 to provide access to an interior of the housing 4. The refrigeration equipment and the wiring of the dispensing machine are considered to be conventional and are not described.

The sets 6 are arranged in five clusters of three sets each mounted side by side within the housing 4. Each cluster 24 of three sets extending from front to rear of the housing 4 is mounted on a tiltable support 14. The second cluster from the right in Figure 1 is tilted forward as shown. In the tilted forward position, all of the tubes 8 within the cluster of three sets can be filled with containers 16 by placing the containers longitudinally into a top of each of the tubes 8. Each container has a top and a base and the top is smaller than the base. The containers are placed right side up in the tubes 8 with the base of each container located beneath the top. When all of the tubes of all of the sets of the tilted forward cluster have been filled with containers, that cluster is tilted back into the housing. A second cluster of three sets of tubes is then tilted forward and those tubes are filled with containers. This process is repeated until all the clusters of three sets each have been tilted forward and filled with containers. By filling the machine in an orderly fashion with a different beverage in each set of four tubes, the dispensing machine 2 can provide a selection of fifteen different beverages. In some cases, an operator of the dispensing machine may decide to place a more popular beverage in more than one set. Also, an operator might decide to set up the machine with fewer than fifteen selections so that each beverage occupies more than one set of the machine and the machine is designed to activate each of the sets for the same beverage in succession until all of the sets for that selection are empty.

Each set 6 of four tubes 8 is bound together near a top and bottom by straps 18. A chute 20 extends beneath the tubes 8 to carry any container 16 passing through any of the tubes to an outlet 22. The container 16 shown on the chute 20 is shown for purposes of

illustration only. Preferably, the machine will not be operable when a group of tubes is tilted forward. An operator may want the machine to be operable when the door is open for testing or start-up purposes. Also, the machine is preferably designed so that when one cluster of three sets each is tilted forward, none of the other clusters can be tilted forward. In other words, the machine is preferably designed so that only one cluster can be tilted forward at one time. When one cluster is tilted forward, the remaining clusters are preferably locked in position. The number of sets that can be contained within a particular housing will vary with the diameter of the tubes and the number of tubes in each set. A larger housing can be designed to accommodate more sets.

In Figure 2, there is shown one cluster 24 of three sets 6 of tubes 8 mounted on the tiltable support 14. The support 14 has an opening 26 to receive a pivot rod (not shown). A rear of the tiltable support 14 has a slot 28 therein to receive a bar (not shown). When mounted in the housing, the clusters 24 can be tilted forward one at a time about the pivot bar for filling purposes. After the tubes have been filled, the clusters 24 can be tilted back into the housing one at a time. When the bar fully enters the slot 28, further rearward tilting will be prevented and the tubes will be substantially vertical. Each set of tubes is held together with straps 18.

In Figures 3 and 4, there is shown a side view and front view of the clusters 24. The same reference numerals are used in Figures 3 and 4 as those used in Figure 2 to describe those components that are identical.

In Figure 5, there is shown a perspective view of an actuator 30. In Figure 5A, there is shown a side view of the actuator 30. The actuator 30 has a shaft 32 with a lower abutment 34 affixed to the shaft

32 by a locking collar 36 beneath the lower abutment 34. The locking collar 36 is welded to the lower abutment 34. The locking collar is locked in position on the shaft 32 by set screws (not shown) in Figure 5. An upper abutment is held in position on the shaft 32 by a locking collar 36 located immediately beneath the abutment 38. The locking collar 36 is welded to the upper abutment 38. A motor 40 is mounted at the top of the shaft 32. The motor is connected to rotate the shaft about its longitudinal centre axis through a coupling 42. The shaft is mounted in a bearing 45 located beneath the upper abutment 38. A height of the lower abutment 34 on the shaft 32 is adjustable. A height of the upper abutment 38 in the embodiment shown is not adjustable, but the upper abutment could be designed to be adjustable. Since the lower abutment is adjustable, the distance between the two abutments is adjustable within a per-determined range. A centering collar 43 centres the shaft 32 within a sleeve 44. The sleeve 44 has a square cross section. The sleeve 44 surrounds the shaft 32 between the abutments 34, 38. Two projections 46 (only one of which is shown) extend out each side of the sleeve 44 between the tubes (not shown in Figures 5 and 5A) to support the actuator 30 and tubes on the support 14 (not shown in Figures 5 and 5A). Both the shape of the sleeve 44 and the projections 46 prevent the sleeve 44 from rotating. There is one actuator 30 mounted in each set of tubes. It can be seen that each of the abutments 34, 38 has a cutaway portion 48 on one side. It can also be seen that the cutaway portions 48 are oriented 180° apart from one another. There are many different ways that the actuator can be designed to achieve the desired result.

In Figure 6, the actuator 30 is located between the tubes 8. The front tube has been omitted from Figure 6 to expose the actuator.

There are openings 52 located in the tubes 8 to accommodate the upper abutment 38. The shaft 32 and abutments 34, 38 rotate in a clockwise direction when viewed from a top. In Figure 6, the actuator 30 is slightly different from the actuator 30 shown in Figures 5 and 5A as there is a gap between the coupling 42 and the upper abutment 38 of the actuator 30 in Figure 6. The same reference numerals are used in Figure 6 as those used in Figures 1 and 5. If it is desired to access the actuator for repairs or replacements, the straps 18 can be severed. When the repair is accomplished, the straps can be replaced to assemble the set.

In Figure 7, there is shown a bottom view of the set 6 of four cylindrically shaped tubes 8. The same reference numerals are used in Figure 7 as those used in Figures 1 and 6 to describe those components that are identical. It can be seen that a container 16 has exited the front tube 8 past the cutaway portion 48 of the lower abutment 34. The container 16 has passed by the lower abutment 34 and will fall to the outlet (not shown in Figure 7). The containers in each of the remaining three tubes of the set 8 are prevented from exiting the tubes 8 by the lower abutment 34. It can be seen that there are containers 16 in the two side tubes 8. The rear tube 8 is not shown in Figure 7, but the rear tube 8 would also have a container that is prevented from exiting the tube by the lower abutment 34.

In Figure 8, there is shown a top view of the upper abutment 38 and in Figure 9 there is shown an edge view of the upper abutment 38. It can be seen that the upper abutment 38 has an opening 54 therein to receive the shaft 32. A straight edge 56 is tilted downward as can be best be seen from Figure 9. A cutaway portion 48 is located just beyond the straight edge 56. It can be seen that the upper abutment 38

has a shape similar to approximately two-thirds of a circle. The edge 56 is bent downward to add strength to the upper abutment 38.

In Figures 10 and 11, there is shown a top view of the lower abutment 34, together with an edge view of the lower abutment 34. It can be seen that the lower abutment 34 has an opening 56. An edge view of the lower abutment 34 is shown in Figure 11. It can be seen from Figures 10 and 11 that the lower abutment 34 is significantly larger than the upper abutment 38. A straight edge 58 of the lower abutment 34 slopes slightly downward to add strength to the abutment 34. A cutaway portion 48 is located just beyond the straight edge 58. The lower abutment has a shape equal to approximately two-thirds of a circle.

In Figure 12, there is shown a bottom schematic view of a set 6 of four tubes 8. In Figure 13, there is shown a schematic top view of a set 6 of four tubes 8. The actuator 30 fits within an interstice 62 between the four tubes 8. The same reference numerals are used in Figures 12 and 13 to describe those components that are identical to the components of Figures 1 and 5. The relative sizes and shapes of the lower abutment 34 and the upper abutment 38 is readily apparent. Also, it can be seen that abutments are oriented 180° apart from one another with the two straight edges facing in opposite directions. The cutaway portions 48 of the two abutments are also oriented 180° apart from one another. The abutments each have a shape similar to a segment of a circle. The projections 46 extend through part of the tubes 8. Since Figures 12 and 13 are schematic views, the thickness of the tube wall is not shown. In an actual assembly, the thickness of the tube walls takes up most of the thickness of the projections so that the projections extend only slightly into an interior of the tubes.

In Figure 14, there is shown a bottom view of one set 6 of four tubes 8 with containers 16 in each of the tubes 8. The same reference numerals are used in Figure 14 as those used in Figure 12 to describe those components that are identical. It can be seen that the container 16 in the bottom right of Figure 14 is supported by the upper abutment 38 and the remaining three containers in the other tubes 8 are supported by the lower abutment 34. In operation, the actuator moves 90° during each activation. The container in the tube 8 in the bottom right (not shown) that had been resting on the lower abutment 34 has been the most recent container to have passed by the lower abutment to the outlet (not shown in Figure 14). When the abutments rotate 90° (counterclockwise when viewed from the bottom) in the next activation, the container 16 in the upper right will pass by the lower abutment to the outlet. When a set is filled with containers after being completely empty, one activation is required before the set will dispense a container. After rotating, the machine can be designed to stop dispensing containers when there is one container left on the lower abutment of each set. With this design, the set will dispense a container upon the first activation. The actuator is fixed vertically relative to said tubes by pressure from the tubes applied to the actuator from the straps.

In Figure 15, there is shown a schematic perspective view of seven containers 16 on the actuator 30 with the tubes removed to expose the containers and part of the actuator. In Figure 16, there is shown a schematic perspective view of six containers 16 mounted on the actuator 30. The actuator is in the same position in Figures 15 and 16. The difference between the two figures is that the front container 16 on the upper abutment 38 shown in Figure 15 has been removed in

Figure 16 to expose more of the actuator 30. The same reference numerals are used in Figures 15 and 16 as those in Figures 1 and 5 for those components that are identical. In Figure 15, there are three containers 16 resting on the lower abutment 34, one at each side and one at the rear. The container that had been at the front on the lower abutment 34 would have fallen to the outlet upon the last activation of the actuator 30. On the upper abutment 38, only the front container 16 is actually resting on the abutment. The other three containers (the two containers at the side and the one container at the rear) are resting on the containers that are located immediately beneath each of those other containers. The containers have a neck that converges at the top and the top is narrower than the base. It can be seen that each of the containers 16 has a height that is greater than the distance between the two abutments 34, 38.

In Figure 16, set screws 63 are shown on the coupling 42 and on the locking collar 36. For ease of explanation, the seven containers 16 shown in Figure 15 are labelled 'a', 'b', 'c', 'd', 'e', 'f', 'g'. The six containers shown in Figure 16 that are identical to the containers of Figure 15 are labelled 'a', 'b', 'c', 'd', 'e', 'f' respectively. In the position shown in Figure 15, the container at the front that had been resting on the lower abutment 34 immediately before the actuator 30 moved to the position shown in Figure 15 has fallen past the lower abutment 34 to the outlet (not shown). The actuator can be set up to rotate either clockwise or counterclockwise, but, in the embodiment shown, the actuator always rotates in the same direction. Also, in the embodiment shown, the actuator rotates 90° for each activation. Assuming that the actuator 30 rotates in a clockwise direction when viewed from above, in the next activation from that shown in Figure

15, the container 'a' will be above the cutaway portion 48 of the lower abutment 34 and will fall to the outlet (not shown). The container 'd' will fall onto the upper abutment 38. In the second activation from that shown in Figure 15, the container 'b' will fall to the outlet and the container 'e' will fall onto the upper abutment 38. Simultaneously, the container 'g' will fall onto the' lower abutment 34. In the third activation from that shown in Figure 15, the container 'c' will fall to the outlet and the container 'f' will fall onto the upper abutment 38. Simultaneously, the container 'd' will fall onto the lower abutment 34. In the fourth activation from that shown in Figure 15, the container 'g' will fall to the outlet. Simultaneously, the container 'e' will fall onto the lower abutment 34. As containers 'c', 'e', 'f' and 'g' fall onto the lower abutment 34, any containers in the tube (not shown) immediately above 'c', 'e', 'f' and 'g' will take the place of containers 'd', 'e', 'f' and 'g' in the position shown in Figure 15, in succession. In other words, containers will be replenished from containers located in the same tube as long as containers are available.

Figure 17 shows a set 64 of four rectangular tubes 66. An interstice 68 for the actuator 30 is created by angling off an inner corner of each of the tubes 66. Except for the angled inner corner, the tubes would have a square cross section. The same reference numerals are used in Figure 17 to describe those components that are identical to the components of Figures 1 and 5. The sets 65 operate in the same manner as the sets 6 with the cylindrically shaped tubes. The actuator 30 is identical to the actuator shown in Figure 5 and is not described in detail. The square tubes can be used to dispense products having a rectangular shape, but tubes having a circular cross section can be used to dispense containers having a rectangular cross sectional shape as

well. Similarly, containers having a circular cross section can be dispensed from square or rectangular tubes. The only requirement is that the containers fit properly within the tubes. It would not be desirable to have a container with an extremely small cross section dispensed from tubes having a relatively large cross section where there is a possibility that the containers within a tube will become misaligned with one another. For example, if the cross sectional area of the tube is so large relative to the cross sectional area of the container, that two containers could partially overlap, the columns might become jammed.

Each set 6 of four tubes 8 has one actuator 30 including one motor 40. Each of the motors is connected to selection means (not shown) so that when a consumer makes the deposit of an appropriate amount of money to the machine, the consumer can select the beverage in any one of the fifteen sets 6. When a particular set is activated, the motor for that set will rotate the actuator 90° and the container that is on the lower abutment 34 immediately before the cutaway portion will fall to the outlet as soon as the abutments rotate. The selection means and the wiring for the dispensing machine is not shown as it is conventional. The dispensing machine can contain heating means or refrigeration means depending on whether the machine is for hot or cold beverages. Usually, the containers will be bottles and will contain beverages. However, the dispensing machines can be used to dispense containers containing products other than beverages. The dispensing machine can also be used to dispense rectangular or square containers. The machine will dispense any diameter of container or any size of container as long as it is small enough to slide easily within the tubes and has a large enough cross section relative to the cross section of the

tubes that it will not become misaligned with containers immediately above or below it to the extent that two or more containers will overlap. Containers must also have a smaller top than a base so that a top portion of a container can be located above the upper abutment when the container rests on the lower abutment. The distance between the two abutments must be less than the height of one container and, preferably, the container narrows at a neck thereof. Adjustments may have to be made to the machine when containers of a different height are used. The machine will accommodate containers of a different height within a certain size range without any adjustment being made. The distance between the abutments can be manually adjusted to extend the range of containers that can be dispensed by a particular actuator. To dispense containers having a height outside of the extended range, a different size actuator will have to be used. The manual adjustments of the actuator are limited by the sleeve 44 and by the length of the shaft 32. A completely different size range can be dispensed with a shorter or longer actuator than that shown in Figure 5. As shown in the drawings, the containers must be taller than the distance between the lower abutment and the upper abutment and the container must be shaped so that the upper abutment does not damage the container as the upper abutment rotates. In other words, the neck of the container has to be narrow enough at the height of the upper abutment to allow the upper abutment to rotate without damaging the containers immediately adjacent to the upper abutment. If a container has a narrower base than a top, an actuator can be chosen with the appropriate distance between the abutments to dispose the containers.

The machine can dispense gable topped containers, for example milk cartons, with a small adjustment added to ensure that the gable

topped containers are oriented correctly and the correct orientation is maintained. For example, in a machine with square or rectangular tubes, the tubes could be sized so that the milk cartons can be oriented correctly within the tubes when the tubes are filled and that orientation is maintained by the tubes themselves. Obviously, if the diameter of the tubes or cross sectional sides of the tubes is smaller in a particular machine, then many more sets of tubes can be included. Preferably, the machine is used to dispense containers having a size of approximately 600 millilitres or larger. Obviously, the larger the cabinet or housing or the smaller the diameter or size of the tubes, the greater number of sets of tubes that can be contained within the housing. There is preferably one selection for each set of tubes. A decision might be made to have more than one selection apply to the same product. Alternatively, the machine could be designed so that it has fewer selections than the number of sets and some selections are designed to operate more than one set. For example, if a manufacturer has a product that is much more popular than other products, the manufacturer might decide to design the dispensing machine so that a selection for the most popular product will dispense containers from, for example, four sets of tubes. The control must then be set up to empty the sets sequentially from the same selection. In other words, the actuators are activated for the first of the four sets until the first set is empty and so on until all four sets are empty. The preferred number of tubes in each set is four. However, sets can be designed to have fewer than four guides or more than four guides in each set. The offset between the upper and lower abutments relative to one another must be adjusted as the number of guides in each set changes.

Existing cabinets have inside dimensions of approximately 34.5 inches in width by 21 inches in depth. When tubes are used having an outside diameter of 3.5 inches, a total of twelve sets of tubes (four tubes per set) can be easily mounted within the cabinet. The present invention can be used with new installations or it can be used to retrofit existing cabinets. New cabinets are now available having an inside width of 36.5 inches and an inside depth of 22 inches. Fifteen sets of four tubes each having an outside diameter of 3.5 inches per tube can easily be mounted within the new cabinet. This provides a maximum of fifteen selections. Tubes having an outside diameter of 3.5 inches can accommodate plastic containers having a volume of approximately 600 millilitres quite readily. The sizes provided are examples only and the invention is not limited to particular sizes or particular dimensions. Other vertical guides could be used in place of the tubes shown. However, tubes are believed to be the most cost effective. While the embodiment shown in the drawings with four tubes per set rotates 90° for each activation and has the cutaway portions offset by 180°, the cutaway portion of the upper abutment could be offset from the cutaway portion of the lower abutment by 90° instead of 180° . In that event, the vertical offset of the abutments would equal the activation distance. An advantage of the present invention is that the sides of the container can be completely redesigned without requiring any adjustment to the machine.